

DESIGN NOTES

LTC1451/52/53: 12-Bit Rail-to-Rail Micropower DACs in an SO-8

Design Note 96

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The LTC[®]1451, LTC1452 and LTC1453 are complete, single supply, rail-to-rail voltage output 12-bit digital-to-analog (DAC) converters. They include an output buffer amplifier and a space saving SPI compatible three-wire serial interface. There is also a data output pin that allows daisy-chaining multiple DACs. These DACs use a proprietary architecture which guarantees a DNL (Differential Nonlinearity) error of less than 0.5LSB. The typical DNL error is about 0.2LSB as shown in Figure 1. There is a built-in power-on reset that resets the output to zero scale. The output amplifier can swing to within 5mV of V_{CC} when unloaded and can source or sink 5mA even at a 4.5V supply. These DACs come in an 8-pin PDIP and SO-8 package.

5V and 3V Operation

The LTC1451 has an on-board reference of 2.048V and a nominal output swing of 4.095V. It operates from a single 4.5V to 5.5V supply dissipating 2mW ($I_{CC(TYP)} = 400\mu A$).

The LTC1452 is a multiplying DAC with no on-board reference and a full-scale output of twice the reference input. It operates from a single supply that can range from 2.7V to 5.5V. It dissipates 1.125mW ($I_{CC(TYP)} = 225\mu A$) at a 5V supply and a mere 0.5mW ($I_{CC(TYP)} = 160\mu A$) at a 3V supply.

The LTC1453 has a 1.22V on-board reference and a convenient full scale of 2.5V. It can operate on a single supply with a wide range of 2.7V to 5.5V as shown in Figure 2. It dissipates 0.75mW ($I_{CC(TYP)} = 220\mu A$) at a 3V supply. The digital inputs can swing above V_{CC} for easy interfacing with 5V logic.

True Rail-to-Rail Output

The output rail-to-rail amplifier can source or sink 5mA over the entire operating temperature range while pulling to within 300mV of the positive supply voltage or ground. The output swings to within a few millivolts of either

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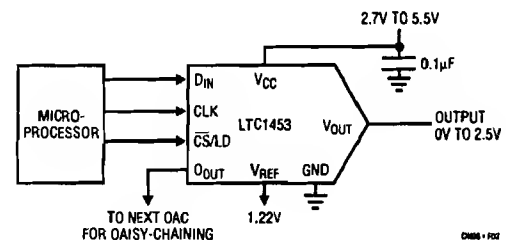


Figure 2. The 3V LTC1453 is SPI Compatible and Talks to Both 5V and 3V Processors

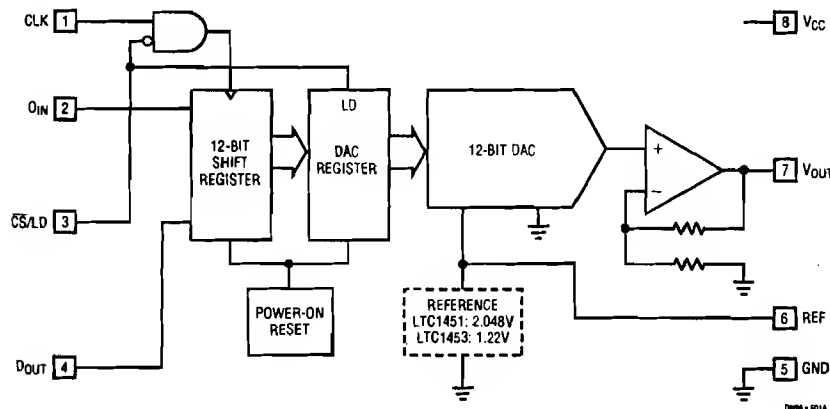


Figure 1. Proprietary Architecture Guarantees Excellent DNL

